TELEX - 06-981298

# OPERATING INSTRUCTIONS

for

STARK

# Micromho Dynamic Mutual Conductance Tube Tester

# Model 9-66

STARK

STARK ELECTRONIC INSTRUMENTS LIMITED

Stark Building - Ajax, Ontario

42 180 STATION ST.

11987

1000-6-52 D.Co.Ltd

STARK ELECTRONIC INSTRUMENTS LIMITED manufacture a complete line of Electrical Indicating Meters, Tube Testers, Circuit Analyzers, and Signal Generators, in sizes and ranges to suit every purpose.

TUBE TESTERS are modern and up-to-date, accurate, and easily operated.

CIRCUIT ANALYZERS can be had in many designs from the handy pocket size to large de-luxe models. They cover an extremely wide range of all electrical measurements.

ELECTRICAL INDICATING METERS incorporated in Stark Tube Testers and Circuit Analyzers are completely manufactured in our own plants.

All meter needs for AC or DC voltage and current measurements, both Panel Mounting and Portable, can be supplied in five distinctive styles, in round or rectangular, from 2" to 9" sizes.

See inside back cover for further details.

## NOTE

WHEN MAKING ENQUIRIES PERTAINING TO THIS INSTRUMENT, PLEASE PROVIDE THE SERIAL NUMBER AS WELL AS THE MODEL NUMBER.

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## IMPORTANT

**SEE INSTRUCTIONS FOR TESTING FILAMENT CONTINUITY ON PAGE 5.**

STARK

# MODEL 9-66

# MICROMHO DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

NOTE

READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO OPERATE THIS TUBE TESTER.

## SECTION I

## DESCRIPTION

1. PURPOSE.

a. The Model 9-66 Tube Tester is used to test and measure mutual conductance values of vacuum tubes used in radio receivers and transmitting tubes delivering less than 25 watts of power.

b. The Model 9-66 Tube Tester is fundamentally of the Dynamic Mutual Conductance type designed to provide either REPLACE - GOOD readings or mutual conductance values in micromhos. Provision is made for locating shorts and leakages between tube elements. A sensitive noise test is also provided.

c. Mutual conductance values in three ranges can be measured: 0-3000, 0-6000, and 0-15,000 micromhos. Included in this tube tester is an ENGLISH reading range. By means of this range, a good tube will cause the pointer of the indicating meter to rest in the GREEN (GOOD) sector of the meter scale. A bad tube will read in the RED (REPLACE) or doubtful (?) sector.

d. Gas Test: Provision is made to test amplifying vacuum tubes for gas content. Gassy tubes will ruin the automatic volume control or intermediate stages of a radio receiver.

2. TUBE COMPLEMENT.--The Model 9-66 requires one #83 mercury vapor rectifier and one 5Y3GT vacuum rectifier tube for its operation. These tubes are supplied and installed in the tube tester. The fuse lamp is a standard #81 auto lamp. The neon lamp is a G.E. 1/4 watt, 105-125 volts, candelabra base.

## SECTION II

## FUNCTIONS OF THE COMPONENTS

3. LINE VOLTAGE ADJUSTMENT. --The Model 9-66 Tube Tester operates from A.C. power lines of 105 to 125 volts, 60 cycles. After the power is turned on, press the push switch P7 (LINE ADJ.) which will cause the indicating meter pointer to move up scale. The button P7 is held down and the knob, LINE ADJUST, is turned until the meter pointer rests exactly over the mark, LINE TEST, at 1500 on the meter scale. This establishes standard voltages to the tube elements. This adjustment is made with the control settings properly arranged for the tube being tested and with the tube in its test socket.

4. SELECTORS.--The row of selector dials across the center of the control panel is for the purpose of conducting proper voltages to the tube's base pins. The operation of setting these dials is similar to DIALING A TELEPHONE NUMBER. On the roll data chart, below the word SELECTORS, appear the dialing numbers. These dialing numbers consist of two letters and five figures. Example: JR-6237-5. Starting at the left, the first dial is turned until the letter "J" appears through the window. The second dial is turned until "R" appears. The

third dial indicates 6; the fourth, 2; the fifth,3;the sixth,7 and the seventh, 5. The lettered dials control the filament or heater connections. The numbered dials control the GRID, PLATE, SCREEN, CATHODE and SUPPRESSOR in that order. In the example given above the heater terminals are connected to pins 8 and 1. The GRID in connected to pin 6; PLATE, to pin 2; SCREEN,to pin 3; CATHODE, to pin 7 and SUPPRESSOR, to pin 5.

These dial switches are electrically interlocked in such a way that it is impossible to connect two different voltage elements to the same pin. Thus accidental shorts are avoided.

The dialing system is designed so that a minimum of dial setting is required. For example,the heater setting is practically always JR so that these two dials seldom need resetting. It will also be noticed that when testing duo - diode triode tubes the amount of dialing has been reduced to a minimum.

5. SHORT TEST, -- Turning the SHORTS switch successively through the position 1-2-3-4-5 connects the various pairs of elements in turn across the test voltage. Tubes having shorted elements will complete the circuit and cause the neon SHORT lamp to glow. Tubes may be tested for shorts, either hot or cold.

A short is indicated by a steady glow of the neon lamp in certain positions of the SHORTS switch. A momentary flash of the lamp as the switch is turned from one position to another should be disregarded. This flashing is caused by the charging of a capacitor in the test circuit. A shorted tube should be discarded without further test.

6. LOCATING SHORTED ELEMENTS, -- In the following table (X) under any SHORT switch position indicates that the neon lamp glows in that position.

| KIND OF SHORT | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| FIL -- CATHODE | | | X | | |
| FIL -- GRID | X | X | | | X |
| FIL -- PLATE | X | X | | X | X |
| FIL -- SCREEN | X | | X | X | X |
| FIL -- SUP | | X | | | |
| GRID -- CATHODE | X | X | X | | X |
| GRID -- PLATE | | | | X | |
| GRID -- SCREEN | | X | X | X | |
| GRID -- SUP | X | | | | X |
| PLATE -- SCREEN | | X | X | | |
| PLATE -- SUP | X | | | X | X |
| SCREEN -- SUP | X | X | X | X | X |

7. NOISE TEST, -- The short test circuit is also used in making noise tests on vacuum tubes. Connections are made from the noise test jacks to the antenna and ground posts of any radio receiver. The tube under test is tapped with the finger as the SHORTS switch is turned through positions 1-2-3-4-5.

Intermittent disturbances which are too brief to register on the neon lamp will be reproduced by the loud speaker as static.

8. GAS TEST, -- The push switch P5 (Fig 1) and P6 (Gas 2) are used to test an amplifier tube for gas content.

a. The MICROMHO switch is set on 3000.

b. The push switch P5 is pressed and held down while the BIAS dial is turned to cause the pointer of the indicating meter to read 100 micromhos.

c. P5 is held down and P6 is pressed

d. If the tube contains gas the meter pointer will move up the scale. If the pointer movement is not more than one small division of the scale the gas content is satisfactory.

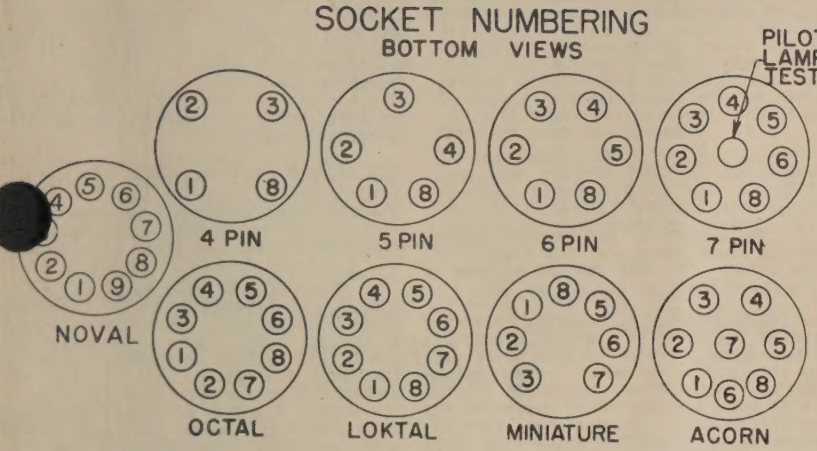
NOTE

With some tubes, such as the type 45,the micromho reading cannot be brought down to 100 by turning the BIAS dial. In such a case turn the BIAS dial to 100 and test for gas.

Some tubes develop gas after being heated for a period of time. If a tube is suspected,allow it to heat for a few minutes.

9. DYNAMIC MUTUAL CONDUCTANCE, -- The push switch P4 is used when testing for mutual conductance value. The indicating meter will register the tube's value in MICROMHOS in three ranges: 0-300,0-6000 and 0-15,000. The range to be used is controlled by the MICROMHO switch. For measuring micromhos in any of the three ranges listed above, no setting of the ENGLISH dial is required.

The fourth range, ENGLISH, on the MICROMHO switch is used when it is desired to test the tube in terms of GOOD-




REPLACE. In this case the ENGLISH dial must be set in accordance with the figures given on the data chart under the heading, ENG. When using the ENGLISH range, good tubes will cause the meter pointer to read in the GOOD sector. Worn out tubes will read in the REPLACE sector. Those tubes which read in the sector marked (?) have some useful life but should be replaced soon. The ENGLISH reading scale is also based on Dynamic Mutual Conductance. It is not an emission test.

The Micromho values printed on the data roll are average values. A small variation above or below these average values is to be expected even with new tubes.

The ENGLISH scale is designed to make tubes read at the left edge of the GREEN (GOOD) sector when 20% below average for amplifier tubes and 35% below [illegible]age for power tubes.

[illegible]RECTIFIER TEST. -- The push switch P2 and P3 are used to test various types of rectifier elements.

a. The push switch P1 is used when testing detector doides. It applies a low voltage which will not injure the delicate cathode. Good diodes will cause the meter pointer to read above the mark, DIODES OK.

b. Push switch P2 is used when testing cold cathode rectifiers such as the 0Z4. This applies a voltage sufficiently high to ionize th. tube and start conduction. Good tubes will read in the GREEN (GOOD) sector of the meter.

c. Push switch P3 is used when testing ordinary rectifier tubes such as the 5Y3. This switch applies a medium voltage which is best adapted to reveal defects in this type of tube. Good tubes will read in the GREEN (GOOD) sector of the meter.

NOTE

On the data chart a star (★) following P1, P2, and P3 indicates that the MICROMHO switch is to be set on ENGLISH.

11. SOCKET NUMBERING. -- In order to reduce dialing to a minimum, the sockets in the Model 9-66 Tube Tester are numbered as shown in Plate 1, which shows

the bottom views. The numerical values of the lettered dials are as follows:

0 ---- A ---- P
1 ---- B ---- R
2 ---- C ---- S
3 ---- D ---- T
4 ---- E ---- U
5 ---- F ---- V
6 ---- G ---- W
7 ---- H ---- X
8 ---- J ---- Y
9 ---- K ---- Z

The letter "I" was ommited because of its resemblance to the figure "1". The letter "Q" was omitted because of its resemblance to the figure "0".

12. METER REVERSE. -- Directly below the indicating meter is a switch marked REVERSE-NORMAL. With certain tubes such as the 117N7, the meter, when set on NORMAL, will deflect backwards (to the left) when push switch P3 is pressed for rectifier test. In such case, turn the meter switch to REVERSE which will cause the pointer to move up the scale. After this test has been made, return the switch to NORMAL.

13. TOP CAPS. -- There are two jacks in the upper center of the control panel marked GRID and PLATE. These are used when making connection to the top cap of the tube being tested. On the data chart in the NOTATIONS column opposite tube types having top caps, is the notation CAP=G or CAP=P. G means that the top cap is connected to the GRID and P, to the PLATE jack.

NOTE

The center of the seven pin socket is used to check pilot lamps. Voltages up to 12.6 are available for pilot lamp test. These voltages are controlled by the filament switch. No further switch setting is necessary.

14. SPECIAL NOTES. -- Power line voltage varies with different localities. It may also vary with the different hours of the day.

While a national survey indicates that the average voltage for the USA is about 117 volts, it does not mean that every locality maintains a constant voltage at that level.

Occasionally we have had the complaint that a used tube will test GOOD, but will not work in the radio receiver; but when a NEW tube is substituted, the receiver will operate correctly. The answer is this: Tubes are built to specifications. Our tube testers are designed to test tubes in conformity with these specifications.

The used tube that would not perform in a certain receiver was not receiving its specified filament voltage. The new tube performed because of its initial reserve capacity. The used tube would have performed if it has received its specified filament voltage.

Tube failure frequently occurs in A.C. -- D.C. sets where several tubes are connected with their heaters or filaments in series. Sometimes, even though the power line voltage is normal, a series tube with abnormally high filament resistance will rob its companion tube of its normal filament voltage. The robbed tube apparently fails; but when tested under specified conditions, the tube will test GOOD.

15. The model 9-66 MICROMHO DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER is equipped with a special feature to enable LIFE TEST to be made on the tube. In the Lower Right of the control panel is a switch designated NORMAL and LIFE TEST.

LIFE TEST

a. Measure the mutual conductance in the ordinary way with switch on NORMAL.

b. Set the MICROMHO range switch on ENGLISH.

c. Press P4 and adjust the ENGLISH dial until the tube reads in the GREEN (GOOD) sector at 2000 on the scale.

d. While holding everything else constant, throw switch to LIFE TEST. This reduces cathode temperature.

e. If the meter still reads in the GREEN (GOOD) sector, the tube has a large life reserve and will perform satisfactorily.

f. After making LIFE TEST return the switch to NORMAL for all other tests.

g. In testing the 3525 and 4525 rectifier tubes it is advisable to turn the power off for about 15 seconds after throwing the LIFE TEST switch to LIFE TEST to allow the cathode to cool. Then turn the power on and note new reading of the meter.

16. CONTINUITY TEST.--The Model 9-66 Tube Tester can be used to test for continuity through resistance up to 200,000 ohms.

a. Set SHORTS switch on position 4.

b. Connect two leads having prods and pin tips to the jacks marked PLATE and GRID.

c. Touch the prods to the terminals through which continuity is to be determined.

d. The neon lamp will glow if circuit is continuous.

FILAMENT AND HEATER CONTINUITY.

1. Turn Tester on
2. Set selectors as per chart for tube to be tested.
3. Set FILAMENT switch on BLST instead of voltage indicated on chart.
4. Set SHORT TEST switch on position 1.
5. Place tube in proper socket.

If the neon lamp glows, the filament is good and a complete test should then be made on the tube, by setting FILAMENT switch on the proper tap, and while the tube heats, rotate the SHORT TEST SWITCH several times thru all positions. If no shorts are indicated, set the switch in TUBE TEST position and proceed to test the tube as per chart.

If Neon lamp does not glow, filament is open and further test is unnecessary. Certain tubes such as the 35Z5-50Z7, etc., with tapped filaments have special continuity test settings, see roll chart.

NOTE

It sometimes happens that a filament will show continuity when cold, but will open when it warms up.

## TO TEST BALLAST TUBES

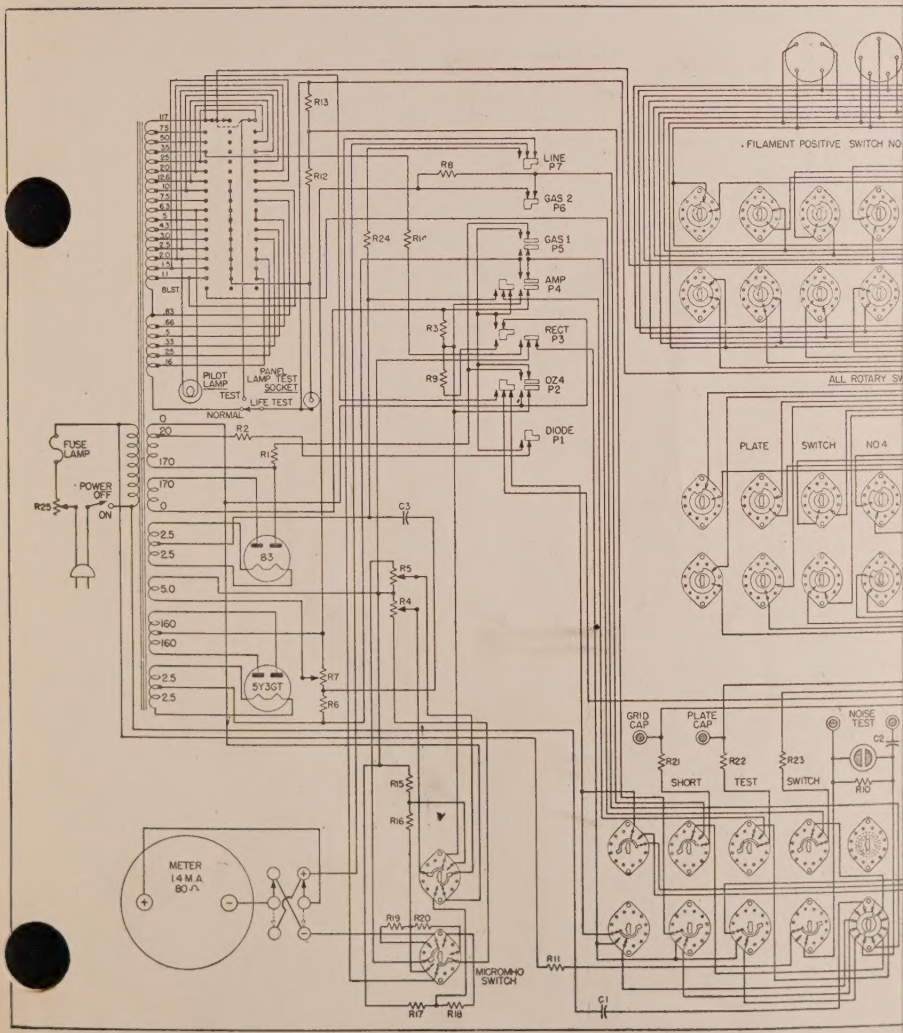
1. Turn Tester on.
2. Set filament switch to BLST.
3. Set SHORT TEST switch on 1.
4. Set first selector switch (lettered A to K) to letter shown in column marked (first selector switch). Set all numbered selectors on zero.
5. ROTATE second selector switch (lettered P to Z) from P to Z. NEON LAMP SHOULD LIGHT IN POSITIONS NOTED.

| TUBE TYPE | First Selector | Neon lamp should light in these positions. | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1A1-1B1-1C1-1E1-1F1-1G1-1J1-1K1-1L1-1N1-1P1-1Q1-1R1G-1S1G-1T1G-1U1G-1V1-1Y1-1Z1-2 | J | R | | | | | | |
| 2UR224 | J | | | T | | | | X |
| 2LR212 | H | R | S | | U | | | |
| 3 | J | R | | | | | | |
| 03G | J | | | T | | | | |
| 4-5 | J | R | | | | | | |
| 6-133 | J | | | T | | | | |
| 6-6AA | J | R | | | | | | |
| 7-8-9 | J | R | | | | | | |
| 10A-10AG | J | | | T | | | | |
| 10AB | J | | | T | | | | X |
| K17B-M17C-BM17C | J | | | T | | | | X |
| M17HG-M17H | J<br>D | R | S | | | | | X |
| K23B-K23C-KX23B-KX30C | J | | | T | | | | X |
| | J<br>D | R | S | | | | | X |
| 30A-K30A | J | | | T | | | | |
| K30D | J | R | | T | | | | X |
| 33A-33AG | J | | | T | | | | |
| K34B | J | | | T | | | | X |

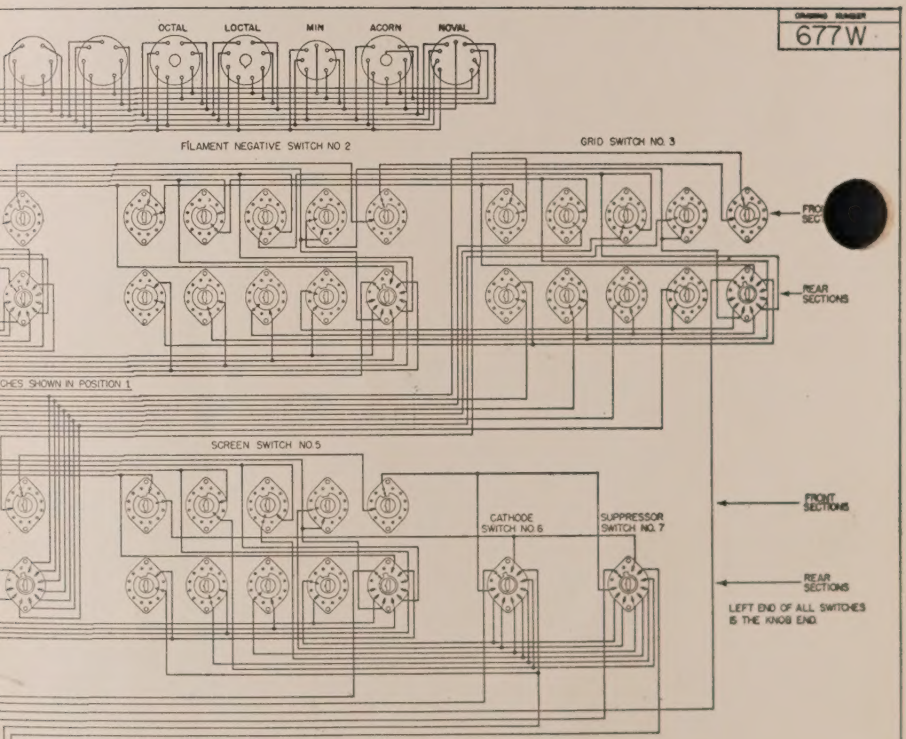
| TUBE TYPE | First Selector | Neon lamp should light in these positions. | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 36A | J | | | T | | | | |
| K36B-BK36B-L36C-BM-L36C-KX36C | J | | | T | | | | X |
| KX36A | J | R | | | | | | |
| 36D-L36D | J | R | | T | | | | X |
| L36DJ | J | R | | T | U | | | X |
| K36H-M36H-M36HG | J D | R | S | | | | | X |
| L40S1-L40S2 | J | R | | T | | V | | |
| 42A | J | | | T | | | | |
| 42A1 | H | | | | U | | | |
| 42A2-42B2 | H | | S | | U | | | |
| K42B-L42B-M42B-KX42B-LX42B-L42BX-K42C-L42C-M42C | J | | | T | | | | X |
| KB42D-K42D-L42D | J | R | | T | | | | X |
| LX42D-L42DX | J | R | S | T | | | | |
| K42E-L42E | J | | | T | | | | X |
| L42F | J D | R | | | | | | X |
| 42HA-K42HJ-M42H-M42HG | J E | R | S | T | | | | X |
| KX42C | J | | | T | | | | X |
| L42S1 | J | R | | T | | V | | |
| 49A-49AJ-K49AJ | J | | | T | | | | |
| KX49A | J | | | T | | | | X |
| 49A1 | H | | | | U | | | |
| 49A2-49B2 | H | | S | | U | | | |
| K49B-L49B-M49B-BM49B-K49C-M49C-BM49C-BK49C-K49E-L49E | J | | | T | | | | X |
| K49D-BK49D-L49D | J | | | T | | | | X |
| L49F | J D | R | | | | | | X |
| M49H-M49HG | J D | R | S | | | | | X |
| KZ49B-KZ49C | J | R | | | | V | | |
| K49BJ-L49BJ | J | | | T | U | | | X |
| L49S2 | J | R | | T | | V | | |
| 49AJ-K49AJ | J | | | T | | | | |
| KX49B-LX49B-LX49C | J | | | T | | | | X |
| L49DJ | J | R | | T | U | | | |
| L49S3 | J | R | | T | | V | | |
| 50A2 | J | R | | T | | | | |
| 50A2MF-50B2 | J | R | | | | V | | |
| 50X3 | J | R | | | | | | |
| K52H-M52H | J D | R | S | | | | | X |

| TUBE TYPE | First Selector | Neon lamp should light in these positions. | | | | | | |
|---|---|---|---|---|---|---|---|---|
| K54B | J | | | T | | | | X |
| 55A-K55A | J | | | T | | | | |
| 55A1 | H | | | | U | | | |
| KX55A | J | R | | | | | | |
| 55B-K55B-M55B-BM55B-L55BG-LX55B | J | | | T | | | | X |
| 55A2-55B2 | H | | S | | U | | | |
| K55C-L55C-KX55C | J | | | T | | | | X |
| [illegible]CP | J | | | T | | V | | X |
| [illegible]-L55D | J | R | | T | | | | X |
| [illegible]E-M55E | J | | | T | | | | X |
| L55F-M55F-BL55F | J<br>D | R | | | | | | X |
| K55H-M55H-M55HG | J<br>D | R | S | | | | | X |
| L55S1-L55S2 | J | R | | T | | V | | X |
| 60R30G | J | R | | T | | | | |
| 64.23 | J | | | T | | | | |
| 67A | J | | | T | | | | |
| K67B-L67B | J | | | T | | | | X |
| L73B-K74B-L74B-CX74C | J | | | T | | | | X |
| 80A | J | | | T | | | | |
| K79B-K80B-M80B-K80C-KX80B-L80B | J | | | T | | | | X |
| K80F | J<br>D | R | | | | | | X |
| KX87B-LX87B-L90B | J | | | T | | | | X |
| K90F-M90F-K92F-M92F | J<br>D | R | | | | | | X |
| 92A | J | | | T | | | | |
| L92B-95K2 | J | | | T | | | | X |
| L99D | J | R | | T | | | | X |
| 100R8 | J | | | T | | | | X |
| 120R | J | R | | | | | | |
| 120RS-135K1 | J | | | T | | | | X |
| 135K1A | J | | | T | U | | | X |
| 140L4-140L8-L40R4-140R8 | J | R | | T | | | | |
| 140R | J | R | | | | | | |
| 140L44-140R44 | J | R | S | T | | | | |
| 165L4-165R4-165R8 | J | R | | T | | | | |
| 165R | J | R | | | | | | |
| 165L44-165R44 | J | R | S | T | | | | |
| 185L4-185L8-185R4-185R8 | J | R | | T | | | | |
| 185R | J | R | | | | | | |
| 185L44-185R44 | J | R | S | T | | | | |
| 200R-250R | J | R | | | | | | |
| 250R8-290L4 | J | | | T | | | | X |
| [illegible]R4-320R4 | J | | | T | | | | X |
| [illegible]-1 | J | R | | | | | | |
| [illegible] | J | | | T | U | | | X |
| [illegible]4980-W43357-W4588-3613 | J | | | T | | | | X |
| 3334-3334A | J | R | | T | | | | X |
| 8593-8596-8601-8664 | J | | | T | | | | X |
| 3ER248 | J | R | | T | U | | | X |
| 3CR241 | J | R | | T | | | | X |

-- NOTES --




SCHEMATIC DRAWING OF MODEL 9-66 MICROMHO




| | | | |
|---|---|---|---|
| R1 | 1800 Λ | R16 | 109 Λ |
| R2 | 1200 Λ | R17 | 41 Λ |
| R3 | 15000 Λ | R18 | 109 Λ |
| R4 | 150 Λ | R19 | 70 Λ ADJUST |
| R5 | 150 Λ — DUAL POT. | R20 | 17 Λ ADJUST |
| R6 | 6000 Λ | R21 | 47 Λ |
| R7 | 3000 Λ POT. | R22 | 47 Λ |
| R8 | 180,000 Λ | R23 | 47 Λ |
| R9 | 15 Λ ADJUST | R24 | 215,000 Λ |
| R10 | 500,000 Λ | R25 | 200 Λ |
| R11 | 15000 Λ | | |
| R12 | 50 Λ | C1 | 1 MFD · 400 V |
| R13 | 50 Λ | C2 | 0005 · 1000 V |
| R14 | 150 Λ | C3 | 0027 · 1000 V |
| R15 | 41 Λ | | |

FRONT SECTIONS

REAR SECTIONS

SCHEMATIC

MODEL 9-66

FILAMENT REDUCTION TUBE CHECKER

MADE BY

**STARK ELECTRONIC INSTRUMENTS LIMITED**

| | | | |
|---|---|---|---|
| SCHEMATIC WIRING DIAGRAM | | | |
| USED ON MODEL 9-66 TUBE TESTER | | | |
| DRAWN | CHECKED | APPROVED | DRAWING NUMBER |
| | | | 677W |

DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER.

**STARK TUBE TESTERS:**

Model 9-11A—Portable "Three Control" Tube Tester.

Model 9-56—Tube Merchandiser, with Battery and Continuity Tests.

Model 9-66—Dynamic Mutual Conductance Tube Tester.

**STARK ANALYZERS:**

Model AF-2—DC 1000 Ohms per Volt, Pocket Size Volt-Ohm Milliammeter

Model SD-1—AC & DC 5,000 Ohms per Volt, Pocket Size Volt-Ohm-Milliammeter.

Model ES-1—AC & DC 20,000 Ohms per Volt, Open Face Analyzer.

Model KM —AC & DC 20,000 Ohms per Volt, DeLuxe Analyzer.

Model TA-1—Electronic Volt-Ohm-Milliammeter (Vacuum Tube) Analyzer.

Model VT-9—Electronic Volt-Ohm-Milliammeter (Vacuum Tube) Analyzer (Large Size).

**STARK SIGNAL GENERATORS:**

Model 10-A—R.F. Signal Generator, 95 K.C. to 144 M.C.

**STARK CATHODE RAY OSCILLOGRAPH:**

Model OS-9—5" With Internal FM Generator.

**TELEVISION ALIGNMENT:**

Model 610A—Universal Television Alignment Signal Generator.

Model 620 —Crystal Controlled Linearity Pattern Generator.

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1034168